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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Martin F. Arlitt et al

Confirmation No.: 5764

Application No.: 09/368,635

Examiner: Isaac Woo

Filing Date: Aug. 4, 1999

Group Art Unit: 2172

Title: CONTENT CONSISTENCY IN A DATA ACCESS NETWORK SYSTEM

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL LETTER FOR RESPONSE/AMENDMENT

Sir:

Transmitted herewith is/are the following in the above-identified application:

(X) Response/Amendment
( ) New fee as calculated below
(X) No additional fee (Address envelope to "Mail Stop Non-Fee Amendment")
( ) Other: _____ (fee $_____)
( ) Petition to extend time to respond
( ) Supplemental Declaration

CLAIMS AS AMENDED BY OTHER THAN A SMALL ENTITY						
(1) FOR	(2) CLAIMS REMAINING AFTER AMENDMENT	(3) NUMBER EXTRA	(4) HIGHEST NUMBER PREVIOUSLY PAID FOR	(5) PRESENT EXTRA	(6) RATE	(7) ADDITIONAL FEES
TOTAL CLAIMS		MINUS		= 0	X $18	$ 0
INDEP. CLAIMS		MINUS		= 0	X $86	$ 0
[ ] FIRST PRESENTATION OF A MULTIPLE DEPENDENT CLAIM					+ $290	$ 0
EXTENSION FEE	1ST MONTH $110.00 [ ]	2ND MONTH $420.00 [ ]	3RD MONTH $950.00 [ ]	4TH MONTH $1480.00 [ ]		$ 0
					OTHER FEES	$
					TOTAL ADDITIONAL FEE FOR THIS AMENDMENT	$ 0

Charge $ 0 to Deposit Account 08-2025. At any time during the pendency of this application, please charge any fees required or credit any overpayment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees. A duplicate copy of this sheet is enclosed.

Date: May 24, 2004

Respectfully submitted,

Martin F. Arlitt et al

By _____

Patrick C. Keane

Attorney/Agent for Applicant(s)
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Date: May 24, 2004

I hereby certify that this document is being filed by personal delivery to the Customer Service Window, Crystal Plaza 2, 2011 South Clark Place, Arlington, Virginia, of the United States Patent & Trademark Office on the date indicated above.

By _____ Reg No 32,858
(Attorney Signature and Reg. No.)

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- Attach as First Page to Transmitted Papers -

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	**Box A-F**
Martin F. Arlitt et al.	Group Art Unit: 2172
Application No.: 09/368,635	Examiner: Isaac Woo
Filed: August 4, 1999	Confirmation No.: 5764
For: CONTENT CONSISTENCY IN A DATA ACCESS NETWORK SYSTEM	

REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Final Office Action dated March 24, 2004, reconsideration and allowance of the present application are respectfully requested. Claims 1-7 are presently pending in the application.

On page 4 of the Office Action, claims 1-3 and 5-7 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,324,565 (Holt) in view of U.S. Patent No. 6,377,991 (Smith). On page 6 of the Office Action, claim 4 is rejected under 35 U.S.C. §103 as being unpatentable over the Holt and Smith patents in further view of U.S. Patent No. 6,012,126 (Aggarwal). In numbered paragraph 3 on pages 2-3 of the Office Action, the Examiner sets forth a response to Applicants' previous remarks.

The foregoing rejections are respectfully traversed, and allowance of the present application is respectfully requested. None of the documents relied upon by the Examiner teach or suggest Applicants' invention as set forth in claim 1. For

example, Applicants' claim 1 recites, among other features, a subscription manager **in a content server** for specifying all of the proxy servers **that are subscribed to a content file** stored in the content server. Claim 1 also recites a consistency manager **in the content server** for notifying all of **so subscribed proxy servers that cache the content file when the content file is updated** in the content server to discard the cached content file from those proxy servers.

As described in the background portion of Applicants' specification, data service systems can include web content servers that host content provided by content providers. Proxy servers provide an ability to cache information, such as objects, received from content providing servers so that information can be quickly retrieved and sent to a client device.

Figure 2 illustrates an exemplary embodiment of the present invention. Referring the Applicants' Figure 2, a data access network system 100 is illustrated for implementing a content consistency scheme in accordance with an exemplary embodiment of the present invention. Content servers in a master data service system 30 store content files which can be accessed by remote proxy data service systems, such as proxy data service system 32. An exemplary data access network system 100 can include a number of master data service systems 30 and proxy service data systems 32.

A subscription manager 40 is provided in the master data service system 30 to specify all proxy servers, such as proxy data service system 32, that consistently cache the content file and that are subscribed to the cached content file. The content consistency scheme of Figure 2 employs a consistency manager 41 to enforce the content consistency scheme. When content of the content file is

updated, deleted, or changed in content servers of the master data service system 30, the consistency manager 41 notifies those proxy data service systems 32 which are subscribed to the content file to discard the cached content file.

In accordance with the exemplary Figure 2 embodiment, a user at terminal 33 can access the services provided by the data service system 30 via the proxy data service system 32 and the Internet 31 (see last paragraph on specification page 11). As described on specification page 13, data service system 30 includes a content storage 43, a core engine 42 and an object manager 44. Components 42-44 implement servers that offer data services of the data service system 30. As described on specification page 14, the subscription manager 40 and consistency manager 41 maintain content consistency between the content files stored in the content storage 43 of the master data service system 30, and the same content files which have been cached in caches, such as cache 50 of the proxy data service system 32.

As described on specification page 16, content consistency is implemented through a publish/subscription mechanism and a new communication protocol. As described in the last paragraph on specification page 16, content files cached in proxy data service system 32 are guaranteed to be consistent with counterparts stored in the master data service system 30 within a predetermined time interval. Such a capability can reduce the need for checking back to the origin content servers, can reduce end user access latency, and can reduce the load on the origin content servers. As a result, network bandwidth demand can be improved.

As described in the last paragraph on specification page 17, when content is retrieved from the master data service system 30 and cached in proxy data service

system 32, a subscription manager 51 included in the proxy data service system 32 can determine if content consistency needs to be applied to the cached content file. If so, subscription manager 51 sends a subscription request to subscription manager 40 of the master data service system 30. Subscription manager 40 can acknowledge the request and add the request to the subscription list maintained by the subscription manager 40 for the cached content file.

When accepting the request, the master data service system 30 returns an acknowledgement using the protocol described in Applicants' specification. The acknowledgement can indicate whether the subscription request is allowed, and for how long. The subscription manager 40 records a return notification address of the subscribing proxy data service system 32 within the meta-data of the cached content file in case it changes.

The consistency manager 41 of the master data service system 30 will generate an invalidation message upon modification or change to the cached content file, provided the monitoring time interval has not elapsed. When the time interval has elapsed, the subscription manager clears the subscription list to provide a network-efficient mechanism for cleaning up the subscription list, as described in the last paragraph on specification page 19.

When the cached content file has been modified or updated within the monitoring time interval, the subscription manager 40 transfers the subscription list to consistency manager 41. Consistency manager 41 informs all proxy data service systems on the subscription list to discard the cached content file. In addition, a modified or updated content file can be forwarded by consistency manager 41 to each subscribing proxy data service system. Figure 4 depicts interactions of an

exemplary content consistency scheme according to an exemplary embodiment of the present invention.

Exemplary embodiments of the present invention overcome deficiencies of previously used content consistency schemes. For example, exemplary embodiments avoid any need for a proxy server, such as the proxy data service system 32, to check with the content server every time the proxy server is accessed. Exemplary embodiments also overcome disadvantages associated with systems wherein a proxy server caches objects received from a content server for only a predetermined period of time during which no content consistency assurance is provided.

The foregoing features are encompassed by independent claim 1. For example, claim 1 is directed to a data access network system that includes a content server coupled to a plurality of proxy servers via an interconnect network, wherein a system of maintaining content consistency between the content server and the proxy servers is provided. Claim 1 recites, among other features, a subscription manager and a consistency manager. The subscription manager is located in the content server, and specifies all of the proxy servers that are subscribed to a content file stored in the content server. The consistency manager is also located in the content server, and notifies all of the subscribed proxy servers that cache the content file when the content file is updated in the content server to discard the cached content file from those proxy servers.

The foregoing features are neither taught nor suggested by the documents relied upon by the Examiner, and the remarks set forth by the Examiner in numbered

paragraph 3 of the Office Action, do not address the shortcomings of these documents.

The Holt patent is directed to a system for dynamically generating documents, wherein an intermediate server retains or caches document programs and data received from a content providing server. When the intermediate server next requires the document, it can be generated at the intermediate server rather than acquiring it from the content providing server. If changes to the document program or data occur, they are **broadcast** to the intermediate servers by the content providing server.

On page 4 of the Office Action, the Examiner acknowledges that the Holt patent "does not explicitly disclose the subscription manager in the content server for specifying all of the proxy servers list that are subscribed to a content file stored in the content server as claimed."

On page 4 of the Office Action, the Examiner asserts that the Smith patent discloses "the claimed proxy server (cache proxy server, definition of cache proxy server is subscribing cache from cache server) array configured to a distributed cache to proxy server." The Examiner asserts on page 5 of the Office Action that a "membership list" disclosed by Smith "specifies all of the proxy servers that are subscribed to a content file". The Examiner then concludes:

> Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to include the subscription manager in the content server for generating and specifying all of the proxy servers list that are subscribed to a content file stored in the content server taught in Smith in the system in the system of Holt to provide proxy server list. Because the list of proxy servers provides quick data access by using the member of proxy servers to check and access member of proxy server to get cache information from the member proxy server.

In the remarks set forth in numbered paragraph 2-3 of the Office Action, the Examiner concludes in the last sentence:

> Thus, Holt and Smith combined disclose or suggest the content server does specify all proxy server that subscribe to content file in content server and the content server notifying subscribed proxy servers that cache content file is updated in the content server to discard the cache content file to the proxy servers.

There would have been no motivation or suggestion to have combined the Smith and Holt documents in the manner suggested by the Examiner. Moreover, even if these documents could have been combined in the manner suggested by the Examiner, the presently claimed invention would not have resulted. Smith's membership list is a list of all proxy servers in an organization. At best, any combination of these teachings would have resulted in using Smith's membership list of all servers in Holt's broadcast scheme. Neither of these documents, alone or in combination, teach or suggest Applicants' claim 1 combination which includes, among other features, a subscription manager **in the content server** for specifying all of the proxy servers **that are subscribed to a content file** stored in the content server, nor do these documents teach or suggest all features of Applicants' claimed "consistency manager".

The Smith patent is directed to having multiple proxy servers act as a single cache, with a single copy of each object being stored among the various servers (see col. 2, lines 33-46). The disclosed system is directed to accessing the server most likely to store a given object (see col. 4, lines 36-43). Column 10, lines 15-23 are cited by the Examiner and refer to a "membership list". However, this is a list of all proxy servers in the proxy server array; **n t** a listing of proxy servers that subscribe to a particular content file, as presently claimed.

In addition, the "membership list" of Smith is not used by a consistency manager for notifying subscribed proxy servers of updates in a content file. Rather, the "membership list" is used to keep track of all proxy servers that are included in the proxy array.

The Smith patent discloses a Cache Array Routing Protocol (CARP) for use in a system having multiple proxy cache servers. CARP is directed to avoiding duplication of content across multiple physical caches. In contrast, exemplary embodiments of the present invention are directed to exactly the opposite type of operation. In the present invention, a cache at each of multiple locations can contain an exact duplicate of information, and the disclosed system is directed to providing consistency between the different locations. In addition, the CARP membership algorithm disclosed by Smith indicates a proxy server which **would** cache an object if it was available, but does not indicate if the object has ever actually been cached at that proxy server. Thus, when an object update occurs, it can be sent to a proxy server even if the proxy server never cached that file.

Thus, the Holt and Smith patents, considered alone or in the combination relied upon by the Examiner, fail to teach or suggest a subscription manager **in a content server** for specifying all of the proxy servers **that are subscribed to a content file** stored in the content server. In addition, these documents fail to teach or suggest a consistency manager **in the content server for notifying** all of so subscribed proxy servers that cache the content file **when the content file is updated** in the content server to discard the cached content file from those proxy servers.

The Aggarwal patent was cited in the rejection of claim 4 as disclosing an admission control logic which uses a popularity criterion. The Aggarwal patent fails to overcome the deficiencies described with respect to the Holt and Smith patents. As such, claim 1 is allowable.

The remaining claims 2-7 depend from claim 1 and recite additional advantageous features which further distinguish over the documents relied upon by the Examiner. As such, dependent claims 2-7 are also allowable.

All objections and rejections raised in the Office Action having been addressed, it is respectfully submitted that the present application is in condition for allowance and a Notice of Allowance is respectfully solicited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

Date: May 24, 2004

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